| Work Order <i>July-11-12 9:44:1</i> | | | *871 | 156* | | | · | | | Page 1 |
|--|--|------------------------|--------------------------|------------------------|------------|--------------|---------------|------------------|------------------|----------------|
| Item ID: De Revision ID: | 412-664-203TRN | | Accept | *N900 | 040 | 100 |)* s | Setup Star | 1/1 | S1* |
| Item Name: Cr | rosstube Turning Detail | | | ÷ | | | | Stop | *N | S2* |
| Start Date: 7/2 Required Date: 8/2 | 20/12 Start Qty: 1.00 03/12 Req'd Qty: 1.00 | *1* *1* | | Cust Item II Customer: | D: | | | ņs. | | |
| Reference: | | • | | | | | | | | |
| Approvals: P | Process Plan: | Date/2-07-1 | 2 Tooling: | Da | | | F | Run Star Stop | 1/1 | R1* |
| (| QC: | Date: | SPC (Y/N): | Da | te: | | | Stop | *N | R2* |
| Sequence ID/ Work Center ID | Operation Description | | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
| Draw Nbr | Revision Nbr | | | | | | | | | |
| D412-664-243 | Rev E(DEO) | : | | | | | | | | |
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| *100* | MORI SEIK! CNC LA | THE LARGE | | | | | | Ø | | |
| Mori Seiki | Memo | | 0.00 | | | | | 7 | | 00.00 |
| Mori Seiki CNC Lathe | 2-Tum fir 3- File tra FOLIO RI | | DT8534 on both ends as p | er Folio FA166 | | | | | | 12/07 |
| 7. Ar. | DWG RE | v: | | | | | | | | |
| 110 110 | QC1- Inspect dimension | ons to dimension sheet | 0.00 | | | +2: | | | | |
| *110* | Memo | *• | 0.00 | | | | | - \$_ | 1 | |
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| Part No: PAR #: Fault Category: Resolution: Disposition: ICR: WORK ORDER NON-COL DATE STEP Description of NC Section A Corrective Action Description D | | | | | | | | |
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| : | | Fault Cat | egory: | NCR: Yes | No DQ | A: | _ Date: _ | |
| R | esolution: | Dispositi | on: <u>`</u> | QA: N/C CI | osed: | | Date: _ | |
| Part No: PAR #: Resolution: NCR: DATE STEP Description of NC | | WORK OR | DER NON-CONFORMA | NCE (NCR | 1) | | | |
| STED | Description of NC | | | | Verific | cation | Approval | Approval |
| SILF | | 1 1 | Action Description Chief Eng | Sign & Date | Secti | ion C | Chief Eng | QC Inspector |
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| | :R | :PAR #: Resolution: STEP Description of NC | STEP PROCEDURE CH PAR #: Fault Cat Resolution: Dispositi WORK ORI STEP Description of NC Section A Initial | STEP PROCEDURE CHANGE PAR #: Fault Category: Resolution: Disposition: WORK ORDER NON-CONFORMA STEP Description of NC Section A Section Section Initial Action Description | PAR #: Fault Category: NCR: Yes Resolution: Disposition: QA: N/C Cle WORK ORDER NON-CONFORMANCE (NCR STEP Description of NC Section A Corrective Action Section B Initial Action Description Sign & | STEP PROCEDURE CHANGE By Date :PAR #:Fault Category:NCR: Yes No DQ Resolution:Disposition:QA: N/C Closed: WORK ORDER NON-CONFORMANCE (NCR) STEP Description of NC | STEP PROCEDURE CHANGE By Date Qty | STEP PROCEDURE CHANGE By Date Qty Chief Eng / Prod Mgr : PAR #: Fault Category: NCR: Yes No DQA: Date: Resolution: Disposition: QA: N/C Closed: Date: WORK ORDER NON-CONFORMANCE (NCR) STEP Description of NC Section A |

Work Order ID 87156 *87156* Page 2 July-11-12 9:44:16 AM D412-664-203TRN Accept *N900040100* Item ID: Setup Start **Revision ID:** Stop Item Name: Crosstube Turning Detail **Start Date:** 7/20/12 Start Oty: 1.00 **Cust Item ID:** Required Date: 8/03/12 Req'd Qty: 1.00 Customer: Reference: Start Run Date: **Tooling: Approvals: Process Plan:** Date: Stop Date: SPC (Y/N): Date: QC: Sequence ID/ Operation Set Up/ **Tool ID** Tool # Plan Accept Reject Reject Insp. Qty Qty Work Center ID Description **Run Hours** Code Number Stamp 0.00 120 MORI SEIKI CNC LATHE LARGE *120* Mori Seiki 0.00 Memo Mori Seiki CNC Lathe Large 1-Turn second side as per Folio FA166 2- File transition lines smooth 3- Remove sand and plugs 4-Scribe part # and #atch # using vibrating stilus FOLIO REV: DWG REV: 130 QC1-Inspect dimensions to dimension sheet 0.00 1 0 KC 12-7-72 *130* 0.00 OC Memo + PERFORM ULTRA SONIC MEASUREMENT Quality Control

140

QC8- Inspect parts - second check

0.00

*14**0***

Memo

0.00

Quality Control

 $+ \, CHECK \, ULTRA \, \, SONIC \, \, MEASUREMENT \, \, AND \, \, ORIENTATION \, FOR \, \,$

BENDING

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| W/O: | | , | W | ORK ORDER CHANG | ES | | | | | |
| DATE | STEP | PR | OCEDURE CH | ANGE | В | у . | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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| Part No | : | PAR #: | Fault Cat | egory: | NCR: | Yes I | No DQA | \ : | Date: _ | |
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| NCR: | | | WORK ORI | DER NON-CONFORMA | ANCE (I | VCR) | | | | |
| DATE | STEP | Description of NC Section A | Initial Chief Eng | Corrective Action Section Description Chief Eng | ion B | ign & Date | Verific Section | | Approval Chief Eng | Approval QC Inspector |
| | | | Office Eng | Gillor Erig | | <u> </u> | | | | |
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|-------------------------------|-------------|--------------------------|-------------------------|----------------------|-------------|--------|----------|--------|-----------------|--------------------------|------------|
| Item ID: Revision ID: | D412-664- | | | Accept | *N900 | 040 | 100* | Setu | p Start Stop | ואיט | 1* |
| Item Name: | Crosstube T | urning Detail | | | | | | | Stop | *NS? | / * |
| Start Date: | 7/20/12 | Start Qty: 1.00 | *1* | | Cust Item I | D: | | | | | |
| Required Date: | : 8/03/12 | Req'd Qty: 1.00 | *1* | | Customer: | | | | | | |
| Reference: | | | | | | | | | | | |
| Approvals: | Process P | lan: | Date: | Tooling: | D: | ate: | | Run | Start | *NR | 1* |
| | QC: | | Date: | SPC (Y/N): | D: | ate: | | | Stop | *NR2 | 2* |
| Sequence ID/ Work Center I | D | Operation Description | | Set Up/ Run Hours | Tool ID | Tool # | | | | Reject Ins Number Sta | sp. |
| 145 | | : | | 0.00 | | | _ | _ | | | |
| *145* | | | | | | | | W | 17 - | 7- 29 | 5 |
| Crosstubes | | Memo | I I TRANSITION I RIPO | 0.00 | | | • | , . | , . | | |
| Crosstubes | | GRIND ON | LY TRANSITION LINES | SMOOTH LONGITUDE | WAY. | | | | | | |
| 150 | | | | 0.00 | | | | \sim | / | | |
| *150* | | | | | | | // | M/n | 112- | 7-2 | 25 |
| HandFXtube | | Memo | | 0.00 | | | 7 | 7/1 | 10 | | |
| Hand Finishing Cro | osstubes | 1- PRESSU | RE WASH X-TUBE INSI | DE AND OUT | | | | , , | V | | |
| | | 2- ACID ET | TCH X-TUBE INSIDE AN | DOUT. USE RED SCO | TCH BRITE | | | | | | |
| 160 | | QC5- Inspect part compl | leteness to step on W/O | 0.00 | | D | , ה י | | | | , |
| <u>*</u> 160* | | | | 0.00 | | ر کوچی | | 1 |) / | 7_7 | 25 |
| QC | | Memo | | 0.00 | | | <i>F</i> | (K | / | L-/- | |

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| W/O: | | | W | ORK ORDER CHANG | GES | | 1001 | | | |
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| Part No: | | | | | | | | | | |
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| Part No | : | PAR #: | Fault Cate | egory: | NCR | : Yes 1 | No DQ | A: | Date: | - E |
| Part No: PAR #: Fa Resolution: Dis NCR: WORK DATE STEP Description of NC Section A | _ Dispositi | on: | QA: | N/C Clo | sed: | | Date: _ | | | |
| Part No: | | V | ORK ORE | ER NON-CONFORM | ANCE | (NCR) |) | | | |
| DATE | STED | Description of NC | | | | | Verific | ation | Approval | Approval |
| DAIL | SILF | Section A | Initial Chief Eng | Action Description Chief Eng | | Sign & Date | Secti | on C | Chief Eng | QC Inspector |
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| | Work Order ID 87156 | | | *871 | 56* | | | | | | Page 4 | | |
|---|----------------------------|---|------------------------|------------------------------|--------------------------|------------|--------------|---------------|------------------|------------------|----------------|--|--|
| Item ID: Revision ID: Item Name: | D412-664-2 Crosstube Tu | | | Accept | *N900 | 040 | 100 |)* s | etup Star Sto | 1/1 | S1* S2* | | |
| Start Date: Required Date Reference: | 7/20/12 | Start Qty: 1.00 Req'd Qty: 1.00 | *1* *1* | G 9 | Cust Item I Customer: | D: | | | | | . 12 | | |
| Approvals: | | an: | Date: | Tooling: SPC (Y/N): | | ate: | - | R | tun Sta | " [/] | R1* R2* | | |
| Sequence ID/ Work Center 1 170 *170* Packaging Packaging | ID | Operation Description Packaging Memo Identify and Location: | l stock in kanban rack | Set Up/ Run Hours 0.00 | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp | | |
| 180 *180* QC Quality Control | | QC21- Final Inspection Memo | - Work Order Release | 0.00 | | | | | _ M (| 512 | 107/25 | | |

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| DATE | STEP | PRO | OCEDURE CHAN | IGE | В | у | Date | Qty | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
| Part No: PAR #: Fault Category Resolution: Disposition: NCR: WORK ORDER | | | | | | | | | | |
| W/O: WORK ORDER CHANGES DATE STEP PROCEDURE CHANGE By Date Qty Approval Chief Eng / Prod Mgr Part No: PAR #: Fault Category: NCR: Yes No DQA: Date: Disposition: QA: N/C Closed: Date: NCR: NORR: Date: NCR: Description of NC Section A Description of NC Section A Description Sign & Verification Section C Chief Eng | | | | | | | | | | |
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| Part No | : | PAR #: | Fault Categ | ory: | NCR: ` | Yes N | lo DQ | A: | _ Date: _ | · |
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| NCR: | - | | WORK ORDE | R NON-CONFORM | ANCE (I | NCR) | | | | |
| DATE | STED | Description of NC | | | | | Verific | ation | | Approval |
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July-11-12 9:44:16 AM

Work Order ID:

87156

Parent Item:

D412-664-203TRN

Parent Item Name:

Crosstube Turning Detail

Start Date: 7/20/12

Required Date: 8/03/12

Start Qty: 1.00

Required Qty: 1.00

Comments:

IPP Rev:A 08-03-06 new issue DD verified by:eec IPP Rev B 08.04.02 Removed polish EC verified by: DD

| | 11 1 1CV D 00.01. | oz removed pon | 311 DC | verified by. Di | | | | | | | | | |
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| Component Item ID/ Item Name | Replacement Item ID | Mfg/ Purch | Bin Item | Primary Location | Last Location | Route Seq ID | Unit of Measure | Qty on Hand | Qty per Kit | Total Qty | Qty Issued | Date Issued | Status |
| D6009-129 | | Manufactured | No | | | 120 | Each | 19.0000 | · 1 | 1 | | | |
| Crosstube Material | | | | | | | | | • | | | | |

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Dart Aerospace Ltd

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| DATE | STEP | PROCEDURE CHANGE | PROCEDURE CHANGE | | | | Approval Chief Eng / Prod Mgr | Approval QC Inspector |
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| Part No: _ | | PAR #: | Fault Category | y: | NCR: Yes No | DQA: | Date: |
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| | Resolution: | | Disposition: _ | S. P. P. | QA: N/C Closed | l: | Date: |

| NCR: | | \$ \$ | WORK OR | DER NON-CONFORMANCE | (NCR) | | | |
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| | | Description of NC | | Corrective Action Section B | | Verification | Approval | Approval QC Inspector |
| DATE | STEP | Section A | Initial Chief Eng | Action Description Chief Eng | Sign & Date | Section C | Chief Eng | |
| | | | ν. | Chief Eng | | | | |
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| DART AEROSPACE LTD | Work Order: | 87156 |
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| Description: Crosstube Assembly (412 High Aft) | Part Number: | D412-664-243 |
| Inspection Dwg: D412-664-243 Rev: E | | Page 1 of 2 |

FIRST ARTICLE INSPECTION CHECKLIST

| In Dra | spection Sheet wing Dimension | Tolerance | Actual Dimension | Accept | Reject | Method of Inspection | Comments |
|-----------|----------------------------------|---------------|---------------------|--------|--------|-------------------------|----------|
| | 2.684 | +0.005/-0.000 | 2.688 | | | VERN | CNC-08 |
| | 2.748 | +0.005/-0.000 | 2.751 | | | 1 | |
| | 2.884 | +0.005/-0.000 | 2.888 | | | | |
| | 3.019 | +0.005/-0.000 | 3,024 | | | | |
| | 3.163 | +0.005/-0.000 | 3.168 | | | | |
| | 3.308 | +0.005/-0.000 | 3.312 | / | | | |
| < | 3.429 | +0.005/-0.000 | 3.433 | ~, | | | |
| SIDE | 2.990 | +0.005/-0.000 | 2 993 | // | | | |
| ळ | 2.618 | +0.005/-0.000 | 2.623 | | | | \ |
| | | | | | | - 7 | ₹7 |
| | 0.200 | +/-0.010 | .200 | | | | |
| | R0.063 | +/-0.010 | .063 | // | | RC | R6 |
| | R0.500 | +/-0.010 | 500 | | | Rb | RG |
| | 4.971 | +/-0.030 | 4.989 | 0 | | VORN | CNC 08 |
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| | 2.748 | +0.005/-0.000 | 2,753 | | | | · |
| | 2.884 | +0.005/-0.000 | 2.889 | / | | | |
| | 3.019 | +0.005/-0.000 | 3,028 | | | | |
| | 3.163 | +0.005/-0.000 | 3.168 | / | | | |
| | 3.308 | +0.005/-0.000 | 3.313 | | | | |
| 8 | 3.429 | +0.005/-0.000 | 3.432 | / | | | |
| SIDE | 2.990 | +0.005/-0.000 | 2.994 | / | | | |
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| | 0.200 | +/-0.010 | .200 | | | V | <u> </u> |
| ļ ! | R0.063 | +/-0.010 | .063 | // | | RG | 126 |
| | R0.500 | +/-0.010 | .500 | // | | 26 | K6 |
| | 4.971 | +/-0.030 | 4.994 | | | VERON | CNC-08 |
| | 124.100 | +/-0.020 | 124.100 | | | tape | 16-22 |

| NCR: | /es | / No | | | | | WORK ORDER NON-C | | NFOR | MANCE / UPD | ATE | | | _ | |
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| | | | | | | | | | | | | QA Closed: | Date | e: | |
| Nork Orde | er: _ | | | | | | DISPOSITION | | | | | | | | |
| Part N | lo | | | | | | Rework Scrap Use-as-is | | | Skid-tube Machining noforming | Crosstube Small Fab Finishing | i | Water Jet d. Eng. Coor. re/Packaging | | Engineering Quality Other |
| NCR N | 10. | | | | | | Work Order Update | | | Large Fab | Composite |] | Supplier | | |
| Root | | Description of work order upda | | | | | | 1 | Initial Action Sign & | | | | | | |
| Cause | | Date Step Qty or Non-conformance | | | | r Non-conformance | Ch | ief Eng | Descr | iption | Date | Verification | | QC Inspector | |
| oc/Data quip/Tooling | | | | | | | | | | | | | | | |
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| | | Bending | | | _ <u> </u> | | Bend BOA4/Banka | \vdash | Grain | | . - | Ovalized | | — | Pressure/Forced |
| | - | Centre No | ot Concer | ntric to | O/S | _ | BOM/Route | \vdash | Hardwa | | - | Over/Under | F | _ | Temperature/Cure Weld |
| | - | Cracks | ~ | | | | Broken/Damaged | <u> </u> | 1 | ion Incomplete | <u> </u> | Part Incorre | | | |
| | | Crushed/Crimped. Burrs | | | | | - | ł | tions Incomplete/U | Inclear | Part Lost/M | issing [| الــــــــــــــــــــــــــــــــــــ | Wrong Stock Pulled | |
| | | Cuffs Contamination | | | | | | - | Mainte | | - | Part Moved | ***** | | , |
| | | Heat Treat Countersink | | | | | | <u> </u> | Mislabe | | <u> </u> | Positioned \ | | | O4h |
| | Н | Inspection Strip in Tube Cut Too Short | | | | | | - | Misrea | a | L | Power Loss, | Surge | | Other |
| | | Ripples in Bend Drill Holes | | | | | | \vdash | Offset | | | | | | |
| | - | Torque Waves in Extrusion Drawing | | | | | | | Out of Calibration | | | | | | |
| | | Turning Se | | | - | $\overline{}$ | Finish | \vdash | • | Sequence | | | | | |
| | | Wave/Tw | ist in Tub | e e | 1 | j | Folio | 1 | Outside | Dimensions | | | | | |

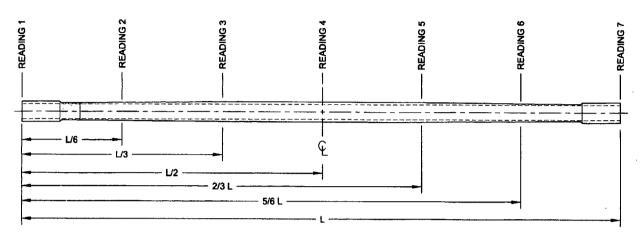
DQA:

Date:

H:/FORMS/Quality Assurance\approved QA/NCRWO Rev G

| DART AEROSPACE LTD | Work Order: | 87156 |
|--|---------------------------------------|--------------|
| Description: Crosstube Assembly (412 High Aft) | Part Number: | D412-664-243 |
| Inspection Dwg: D412-664-243 Rev: E | · · · · · · · · · · · · · · · · · · · | Page 2 of 2 |

WALL THICKNESS MEASUREMENT



| _ | WALL | THICKNESS I | MEASUREMEN | NT (IN) | Deviation | |
|--------------------|---------------|-------------|------------|---------|-----------------|-----------|
| Location | w1 | w2 | w3 | w4 | Δw (max-min) | TOLERANCE |
| READING 1 L= 0" | .377 | .383 | .383 | . 365 | .018 | |
| READING 2 L= | . 308 | .327. | .320 | .303 | .024 | |
| READING 3 L= | .479 | .492 | .485 | .477 | .015 | |
| READING 4 L= | 635 | ,643 | ,642 | .631 | .012 | 0.073" |
| READING 5 L= | , 48 3 | .490 | ,484 | . 47/ | .019 | |
| READING 6 L= | .3/0 | .328 | .319 | . 298 | .018 | |
| READING 7 L= | ,375 | .383 | .375 | .361 | -022 | |

Calibration Result

Actual Block Thickness: 100'500

Sitescan 250 Measured Thickness: 100 500

| Measured by: | Kc |
|--------------|---------|
| Date: | 12-7-22 |

Audited by: Date: Preliminary Approval: Date:

| Rev | Date | Change | Revised by | Approved |
|-----|----------|---------------------------------------|------------|----------|
| Α | 04.06.16 | New Issue (P/O D412-664-203) | KJ/JLM | |
| В | 06.03.09 | Dwg Rev updated | KJ/JLM | |
| С | 07.05.08 | Tolerance updated for dimension 4.971 | KJ/JLM | |
| D | 10.02.02 | Dimension 124.100 was 124.09 | KJ , A | 11 |
| Е | 12.06.04 | Wall thickness form added | KJ OU | /18 |
| | | | 171 | |

| | | | | | | | | | | | DQA: | Date | : |
|---------------|------------------------------|-----------|------------|------|--------|----------------------------|----------|-----------|-------------------|-----------|---------------|--------------|--------------------|
| NCR: | Yes | / No | | | | WORK ORDER NON-C | O | NFORN | MANCE / UP | DATE | | | |
| | | • | | | | | | | | | QA Closed: | Date | : |
| Work Ord | or. | | | • | | DISPOSITION | | | | | | | |
| WOIK OIG | CI. | | | | | Rework | 1 | | Skid-tube | Crosstube | 1 | Water Jet | Engineering |
| Part I | Nο | | | | | Scrap | | Machining | Small Fab | Pro | d. Eng. Coor. | Quality | |
| Taiti | 10. | | | | | Use-as-is | 1 | | noforming | Finishing | ł | re/Packaging | Other |
| NCR | No. | | | | | Work Order Update | | | Large Fab | Composite | 1100/310 | Supplier | " |
| | | | | | | Work order opaute | , | | 20.80 102 | | J | 00.00 | · [|
| Root | | | | | | ption of work order update | | nitial | Ac | tion | Sign & | | |
| Cause | se Date Step Qty | | | | (| or Non-conformance | Ch | ief Eng | Desc | cription | Date | Verification | QC Inspector |
| Doc/Data | | | | | | | | | | | | | |
| Equip/Tooling | | | | | | | | | | | | | |
| Operator | | | | F | | | | | | | | | |
| Material | | | | | | | | | | |] | | |
| Setup | | | | | | | | | | | | | |
| Other | | | | | | | | | | | (5° | | |
| Process | | | | | | | | | · | | قي. ا | | |
| Supplier | | | | | | | | | - | | | | |
| Training | | | | | | | | | | | | | |
| Unapproved | <u> </u> | | | | | | | | | | | | |
| | | | | | ······ | F | AUL | T CATE | GORY | | | | |
| Landi | ng (| 7 | | | _ | General | | , | | | 7 | _ | |
| Bending | | | | | | Bend | <u></u> | Grain | | _ | Ovalized | _ | Pressure/Forced |
| 1 | Centre Not Concentric to O/S | | | | | BOM/Route | <u></u> | Hardwa | | | Over/Unde | - | Temperature/Cure |
| | Cracks | | | | | Broken/Damaged | \vdash | 1 | on Incomplete | <u> </u> | Part Incorre | <u>-</u> | Weld |
| | Crushed/Crimped. | | | | | Burrs | | 4 | ions Incomplete, | /Unclear | Part Lost/N | | Wrong Stock Pulled |
| | Cuffs | | | | | Contamination | | Mainte | | | Part Moved | | |
| | L | Heat Trea | | | L | Countersink | | Mislabe | eled | <u></u> | Positioned | | 1 |
| l | | Inspectio | n Strip in | Tube | | Cut Too Short | 1 | Misread | i | | Power Loss | /Surge | Other |

Offset

Out of Calibration

Out of Sequence

Outside Dimensions

Ripples in Bend

Turning Sequence

Wave/Twist in Tube

Torque Waves in Extrusion

Drill Holes

Drawing

Finish Folio

H:/FORMS/Quality Assurance\approved QA/NCRWO Rev G

| Item | Qty -243 | Part Number | Description |
|------|-------------|----------------|--|
| 1 | х | D412-664-243 | CROSSTUBE ASSEMBLY (412 HIGH AFT) |
| 2 | 1 | D6009-129 | CROSSTUBE |
| 3 | 2 | D3595-063-570 | RUBBER CUSHION |
| 4 | 1 | D2896-1 | SUPPORT |
| 5 | 2 | D3189-1 | CHAFING SHIELD |
| 6 | 2 | D2856-600-1009 | ABRASION STRIP |
| 7 | 4 | MS21920-28 | CLAMP |
| 8 | 2 | MS21920-30 | CLAMP (OR MS21920-32) |
| 9 | A/R | MAGNOBOND 6398 | ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTROMBELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE) |

GENERAL NOTES:

1) MATERIAL: MANUFACTURED FROM D6009-129

FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING/TRIMMING)

2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1 PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2 PAINT OUTSIDE PER DART QSI 005 4.2

- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: SCRIBE DART PART NUMBER "D412-664-243" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- WEIGHT: 47.0 lbs (PER IIN-D212-664)
- PART IS SYMMETRIC ABOUT CENTERLINE.
- RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALY, TRANSITION SHOULD BE SMOOTH.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
 12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015 LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 13) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1. SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT.
- 14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 15) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES. NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

81156 pl 120212

@ DEO ATTACHED

R

| E | REORG TO CUP PAR 08- C8-3 & 6 | ANIZED VIEW RENT STAND 046 (ZN A6-3) | GENERAL NOTES; IS AND REFORMATTED DRAWING IARDS; RELOCATED FLAG #6 PER; ADD TOLERANCE (ZN B6-3, C4-3, TURNING DETAIL & UPDATED ET 4. | , RF | 09.09.30 | | | | | | |
|-----------------|--|--|--|------------------------|----------|--|--|--|--|--|--|
| D | REMO | VE D2732-058 | 3, CHANGE TO D3595-063-570 | PH | 07.03.09 | | | | | | |
| C. | | | 0-1087, ADD D2732-058 & . MS21920-32 WAS MS21920-30 | МВ | 06.10.27 | | | | | | |
| В | ADD H | | OMPATABILITY WITH BHT/AA | РН | 05.02.04 | | | | | | |
| Α | NEW IS | SSUE | | PH | 01.10.17 | | | | | | |
| REV. | | | DESCRIPTION | BY | DATE | | | | | | |
| DESIGN DRAWN | | PH RF | DART AEROSP HAWKESBURY, ONTAK | | | | | | | | |
| CHECK | ED | P | DRAWING NO. | | REV. E | | | | | | |
| MFG. AF | PR. | Z | D412-664-243 | 0412-664-243 SHEET 1 0 | | | | | | | |
| APPRO | VED | 10 | TITLE SCALI | | | | | | | | |
| DE APP | R. | -# | CROSSTUBE ASSEMBLY (| 412 HI | AFT) NTS | | | | | | |
| DATE | | | COPYRIGHT © 2001 BY DART AEROSPACE LTD | | | | | | | | |

09.09.30

| NCR: Yes / No WORK ORDER NON-CONFORMANCE / UPDATE | | | | | | | | | | | | | | |
|---|-------------------------------------|------------|-------------|-----------|----------------|---|----------|-------------------|-------------------|------------------------|----------|---------------------------|------------|--------------------|
| - | | | | | | *** | | | | | QA Clos | ed: | Date: | |
| Work Ord | er: | | | | | DISPOSITION | | | | AGAINST D | EPARTMI | NT/PRO | CESS | |
| Part No | | | | | | Rework Scrap Use-as-is Work Order Update Skid-tube Machining Machining Thermoforming Finishing Large Fab Composite | | | Rec/ | Prod. Eng Store/Pag | | Engineering Quality Other | | |
| Root | | | | | Descri | ption of work order update | | Initial | Act | ion | Sign | Š. | | |
| Cause | | Date | Step | Qty | | or Non-conformance | Ch | nief Eng | Descr | iption | Date | Ve | rification | QC Inspector |
| Doc/Data | | | | | | | | | | | | | | |
| Equip/Tooling | | | | | | | | | | | | | | |
| Operator | Ш | | | | | | | | : | | | | | |
| Material | | | | | | | | | | | | | | |
| Setup | | | ļ | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | |
| Process | | | | | | | 1 | | | | | | | |
| Supplier | | | | | | | | | | | | | | |
| Training | | | | | | | | | | | | | | |
| Unapproved | | | <u> </u> | | <u> </u> | | | | | | | | | |
| <u> </u> | | | | | | | AUI | LT CATE | GORY | | | | | |
| Landi | | 1 | | | | General | | J | | Г | ٦ | | |]_ /r / |
| | | Bending | | | o /c | Bend | \vdash | Grain | | - | Ovalize | | | Pressure/Forced |
| 1 | _ | Centre N | ot Concei | ntric to | ^{0/5} | BOM/Route | \vdash | Hardwa | | - | _ | nder tolera | ince | Temperature/Cure |
| | \vdash | Cracks | · | | | Broken/Damaged | - | ⊣ ` | on Incomplete | 4-1 | Part Inc | | - | Weld |
| | Crushed/Crimped. Cuffs | | | | | Burrs | \vdash | Mainte | ions Incomplete/l | Juciear | ⊣ | t/Missing | L | Wrong Stock Pulled |
| | \boldsymbol{arphi} | | | | | Countarials | \vdash | 4 | | - | Part Mo | | | |
| | Heat Treat Inspection Strip in Tube | | | | | Countersink | | Mislabe | | - | wmw | ed Wrong | | Joshan |
| | \vdash | Ripples in | • | rube | | Cut Too Short Drill Holes | - | Misread Offset | 1 | <u>L</u> | rower i | .oss/Surge | L. | Other |
| | | Torque V | | Sytemotic | _ - | -1 | \vdash | -1 | Calibration | | | | | |
| 1 | 1 | rorque v | vaves iii t | .xu:u510 | " | Drawing | 1 | log of a | Landi alion | | | | | |

Out of Sequence

Outside Dimensions

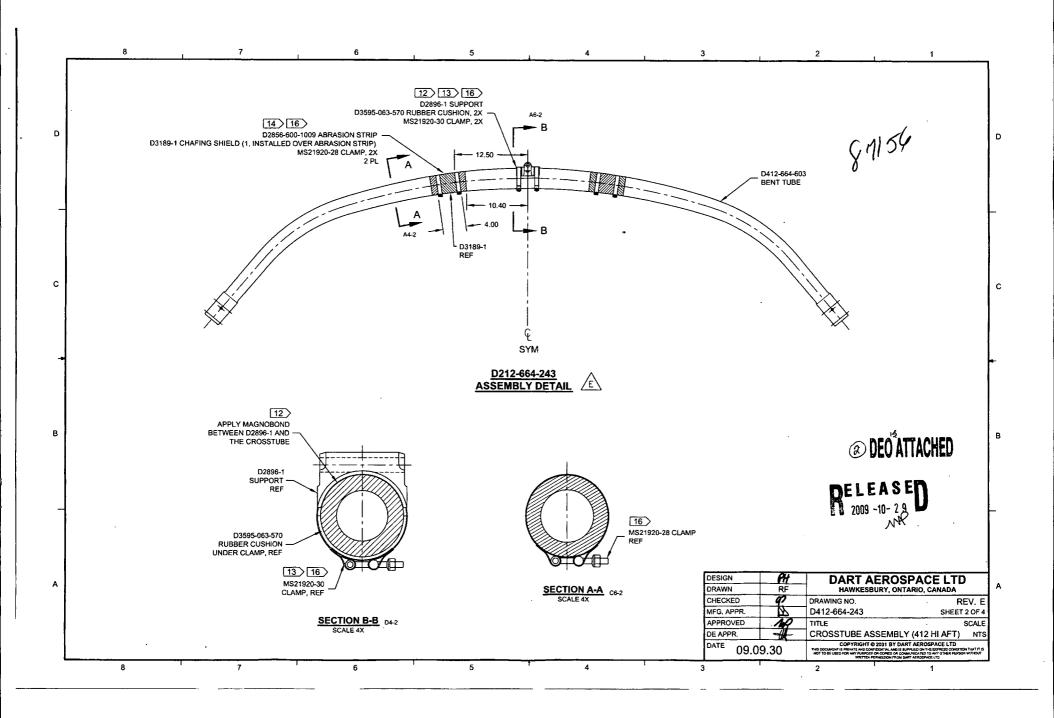
DQA: _____ Date: ____

Turning Sequence

Wave/Twist in Tube

Finish

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| | | | | | | | | | | | | DQA: | Dat | :e: | |
|---|--|------------|------|-----|--------|---|---|----------|-------------------|-----------|----|--|----------------------|---------------------------|--|
| NCR: | Yes | / No | | | | WORK ORDER NON-O | 100 | NFORM | JANCE / UP | DATE | | · | - | - | |
| | | | | | | | | | | | (| QA Closed: | Dat | æ: | |
| Work Orde | or. | | | | | DISPOSITION | | | | AGAINST D | EP | ARTMENT | PROCESS | | |
| Part f | No. | | | | | Rework Skid-tube Crosstube Machining Small Fab Thermoforming Finishing Composite | | | | | | Water Jet d. Eng. Coor. e/Packaging Supplier | | Engineering Quality Other | |
| Root | | <u>-</u> | | | Descri | ption of work order update | | Initial | Ad | tion | | Sign & | | | |
| Cause | | Date | Step | Qty | C | or Non-conformance | Ch | nief Eng | Desc | cription | | Date | Verification | <u>1</u> | QC Inspector |
| Doc/Data Equip/Tooling Operator Material Setup Other Process Supplier Training Unapproved | | | | | | | | | | | | | | | |
| | | | | | | | AUI | LT CATE | GORY | | | | | | |
| Landi | ding Gear Bending Centre Not Concentric to O/S Cracks Crushed/Crimped Cuffs Heat Treat Inspection Strip in Tube | | | | | General Bend BOM/Route Broken/Damaged Burrs Contamination Countersink Cut Too Short | Grain Hardware Inspection Incomplete Instructions Incomplete/Unclear Maintenance Mislabeled | | | | | Ovalized Over/Under Part Incorred Part Lost/Mi Part Moved Positioned V Power Loss/ | ct ssing Vrong | | Pressure/Forced Temperature/Cure Weld Wrong Stock Pulled Other |
| | | Ripples in | Bend | | | Drill Holes | 1 | Offset | | _ | | | _ | | |

Out of Calibration

Out of Sequence

Outside Dimensions

H:/FORMS/Quality Assurance\approved QA/NCRWO Rev G

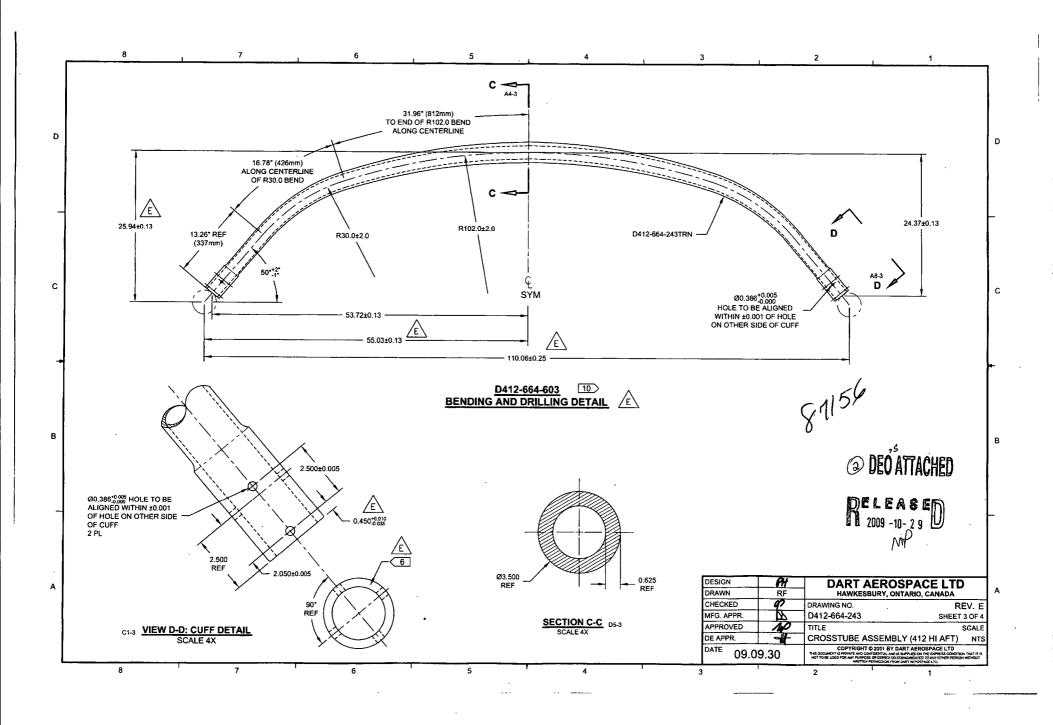
Turning Sequence

Wave/Twist in Tube

Torque Waves in Extrusion

Drawing

Finish



| NCR: | Yes | / No | | | | WORK ORDER NON- | O | VFOR | MANCE / UPI | DATE | | OA Classide | 0 | ata. | |
|---|--|------|------|-----|---|---|---|----------|---------------------------------------|-----------|--|-----------------------|-----------------------------|--|--------------|
| r | | | | | | <u> </u> | | | | | | QA Closed: | | ate: | |
| Work Order: DISPOSITION | | | | | | | | | | AGAINST D |)Ef | PARTMENT, | PROCESS | | |
| Part No. NCR No. | | | | | | Rework Scrap Use-as-is Work Order Update Skid-tube Machining Machining Small Fab Thermoforming Large Fab Composite | | | Prod. Eng. Coor. Rec/Store/Packaging | | | r. g | Engineering Quality Other | | |
| Root | | | | | Descri | ption of work order update | | Initial | Act | ion | ٦ | Sign & | | | |
| Cause | | Date | Step | Qty | | or Non-conformance | Ch | ief Eng | Descr | ription | | Date | Verificati | on | QC Inspector |
| Doc/Data Equip/Tooling Operator Material Setup Other Process Supplier Training Unapproved | | | | | | - | | | | | | | | | · |
| Londi | | | | | | General | AUL | T CATE | GORY | | | | | | |
| Landi | Centre Not Concentric to O/S Cracks Crushed/Crimped. Cuffs Heat Treat Inspection Strip in Tube Ripples in Bend | | | | Bend BOM/Route Broken/Damaged Burrs Contamination Countersink Cut Too Short Drill Holes | | Grain Hardware Inspection Incomplete Instructions Incomplete/Unclear Maintenance Mislabeled Misread Offset Out of Calibration | | | | Ovalized Over/Under Part Incorre Part Lost/M Part Moved Positioned N | ct issing Vrong | | Pressure/Forced Temperature/Cure Weld Wrong Stock Pulled Other | |
| 1 | Torque Waves in Extrusion Drawing | | | | | Drawing | L | Out of (| Calibration | | | | | | |

Out of Sequence
Outside Dimensions

DQA:

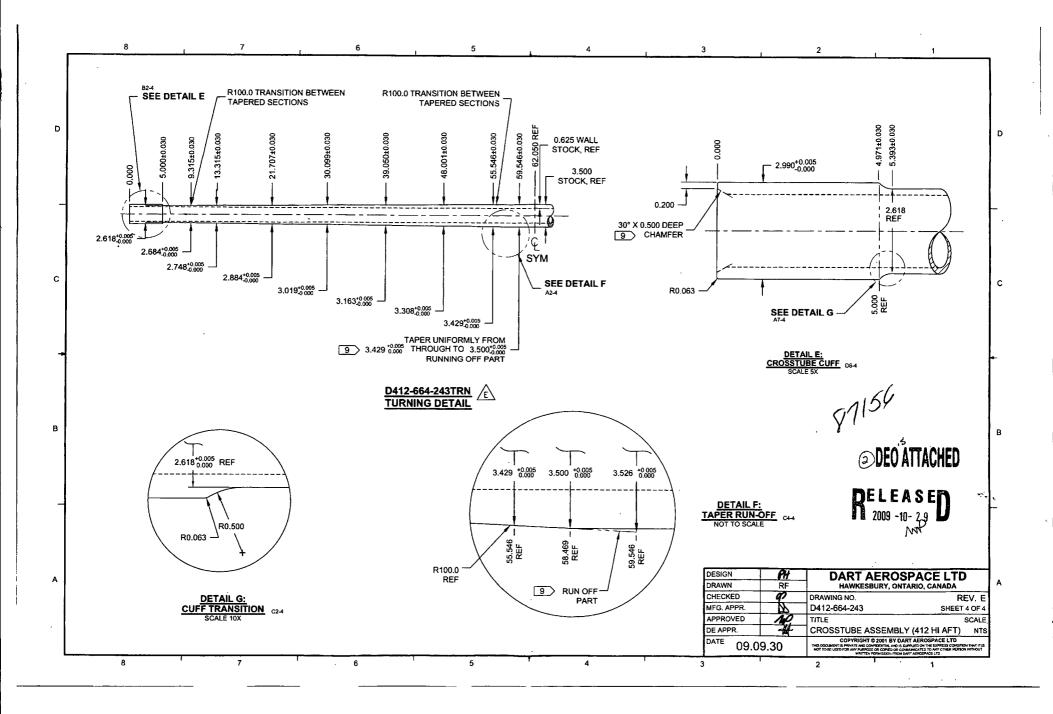
Date:

Turning Sequence

Wave/Twist in Tube

Finish

H:/FORMS/Quality Assurance\approved QA/NCRWO Rev G



| | | | | | | | | | | | DQA: | Da | te: _ | |
|---------------|------------------------------|------------|-----|---|----------------------------|----------------------------|-------------|-----------------|-----------|---|--------------|---------------|----------|--------------------|
| NCR: | Yes / | No | | | WORK ORDER NON- | COI | VFOR | MANCE / UP | PDATE | | | | | |
| | | | | | | | | | | | QA Closed: | Da | te: | |
| Work Orde | or: | | | | DISPOSITION | AGAINST DEPARTMENT/PROCESS | | | | | | | | |
| WOIK OIG | e | . , | | | Rework | ٦ | | Skid-tube | Crosstube | | 1 | Water Jet | | Engineering |
| Part I | No. | | | | Scrap | 1 | | Machining | Small Fab | | Pro | d. Eng. Coor. | \vdash | Quality |
| | | | | | Use-as-is | 1 | | noforming | Finishing | | ł | re/Packaging | \vdash | Other |
| NCR I | No | _ | | | Work Order Update |] | | Large Fab | Composite | |] | Supplier | | |
| | | | | | | | | | | | | | | |
| Root | | | | 1 | ption of work order update | ı | Initial | | ction | | Sign & | | | |
| Cause | Da | ite Step | Qty | | or Non-conformance | Ch | ief Eng | Desc | cription | | Date | Verificatio | n | QC Inspector |
| Doc/Data | Щ | | | | | | | | | |] | | | |
| Equip/Tooling | Ш | | | | | | | | | | | |] | |
| Operator | \square | | | | | | | | | | | | l | |
| Material | Ш | | | | | | | | | | | | | |
| Setup | Ш | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | | |
| Process | Ш | | - | | | | | | | | | | | |
| Supplier | | | | ł | | | | | | | | | | |
| Training | | 1 | | | | | | | | | | | | |
| Unapproved | | | | | | | | · | | | | | | |
| - | | | | | F | AUI | T CATE | GORY | | | | | | |
| Landi | ng Gear | | | | General | | _ | | | | = | | | |
| | Bending | | | | Bend | L | Grain | | | L | Ovalized | | | Pressure/Forced |
| | Centre Not Concentric to O/S | | | | BOM/Route | | Hardwa | re | | L | Over/Under | tolerance | | Temperature/Cure |
| | Crac | ks | | | Broken/Damaged | | Inspect | on Incomplete | | | Part Incorre | ct | | Weld |
| | Crus | hed/Crimpe | d. | | Burrs | | Instruct | ions Incomplete | /Unclear | | Part Lost/M | issing | | Wrong Stock Pulled |
| 1 | Cuffs | | | | Contamination | | Maintenance | | | Г | Part Moved | | | - |

Mislabeled

Out of Calibration

Out of Sequence

Outside Dimensions

Misread

Offset

Positioned Wrong

Power Loss/Surge

Other

Turning Sequence

Wave/Twist in Tube

Ripples in Bend

Heat Treat

Inspection Strip in Tube

Torque Waves in Extrusion

Countersink

Cut Too Short

Drill Holes

Drawing

Finish

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| DRAWING NO | D. TITLE | REV. E | DART AEROSPACE LTD | D.E.O. NO. | SHEET NO. | SCALE |
|------------|----------------|--------------------------|--------------------------|------------------|---------------|-------|
| D412-664-2 | 243 CROSSTUE | BE ASSEMBLY (412 HI AFT) | ENGINEERING ORDER | D412-664-243-E-1 | SHEET 1 OF 2 | NTS |
| DRAWN | | CHECKED A | MFG. APPR. | APPROVED WAP | DE APPR. | |
| DATE | 11.03.31 | DATE 11/03.31 | DATE //.03.31 | DATE 11/03:3) | DATE 11-03.31 | |

PURPOSE:

REMOVED ABRASION STRIP IN FAVOR OF A THIN LAYER OF PROSEAL 890.

CHANGE:

PARTS LIST IS AMENDED AS FOLLOWS:

IS:

| item | Qty -243 | Part Number | Description |
|------|-------------|----------------|----------------|
| 6 | 0 | D2856-600-1009 | ABRASION STRIP |

WAS:

| | | 1.00 | |
|---|---|----------------|----------------|
| 6 | 2 | D2856-600-1009 | ABRASION STRIP |
| | | | |

NOTES 2 AND 14, SHEET 1 ARE AMENDED AS FOLLOWS:

IS:

2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2

MASK UNDERSIDE OF CROSSTUBE AS SHOWN (HATCHED AREA)

PAINT OUTSIDE PER DART QSI 005 4.2

AFTER PAINTING, APPLY CLEAR COAT ON HATCHED AREA

14) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEALED D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.

WAS:

2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2

14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035. 87154



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| | | | | | | | | | | | DQA: | Date: | | | |
|---|---|------|------|-----|--------|---|--|---|-------------|---|--|--|--|--|--|
| NCR: Y | es/ | / No | | | | WORK ORDER NON-C | 100 | NFORM | MANCE / UPE | DATE | | | | | |
| | | | | | | | | | | | QA Closed: | Date | | | |
| Work Orde | ır. | | | | | DISPOSITION AGAINST DEP | | | | | | PARTMENT/PROCESS | | | |
| Part N | Part No | | | | | Rework Scrap Use-as-is Work Order Update | Scrap Machining Small Fab Use-as-is Thermoforming Finishing | | | Crosstube Small Fab Finishing Composite | 4 | Water Jet d. Eng. Coor. e/Packaging Supplier | Engineering Quality Other | | |
| Root | | | | | Descri | ption of work order update | Ī | Initial | Act | ion | Sign & | | | | |
| Cause | | Date | Step | Qty | C | or Non-conformance | Ch | ief Eng | Descr | iption | Date | Verification | QC Inspector | | |
| Doc/Data Equip/Tooling Operator Material Setup Other Process Supplier Training Unapproved | | | | | | | | | | | | | | | |
| | | | | | | | AUL | T CATE | GORY | | | | | | |
| Landi | Bending Centre Not Concentric to O/S Cracks Crushed/Crimped Cuffs Heat Treat Inspection Strip in Tube | | | | o/s | General Bend BOM/Route Broken/Damaged Burrs Contamination Countersink Cut Too Short | | Grain Hardware Inspection Incomplete Instructions Incomplete/Unclear Maintenance Mislabeled Misread | | | Ovalized Over/Under Part Incorre Part Lost/M Part Moved Positioned \ Power Loss/ | ct issing | Pressure/Forced Temperature/Cure Weld Wrong Stock Pulled Other | | |
| | Ripples in Bend | | | | | Drill Holes | Ė | Offset | | ļ | J. 3 | | 1 | | |

Out of Calibration

Out of Sequence

Outside Dimensions

Turning Sequence

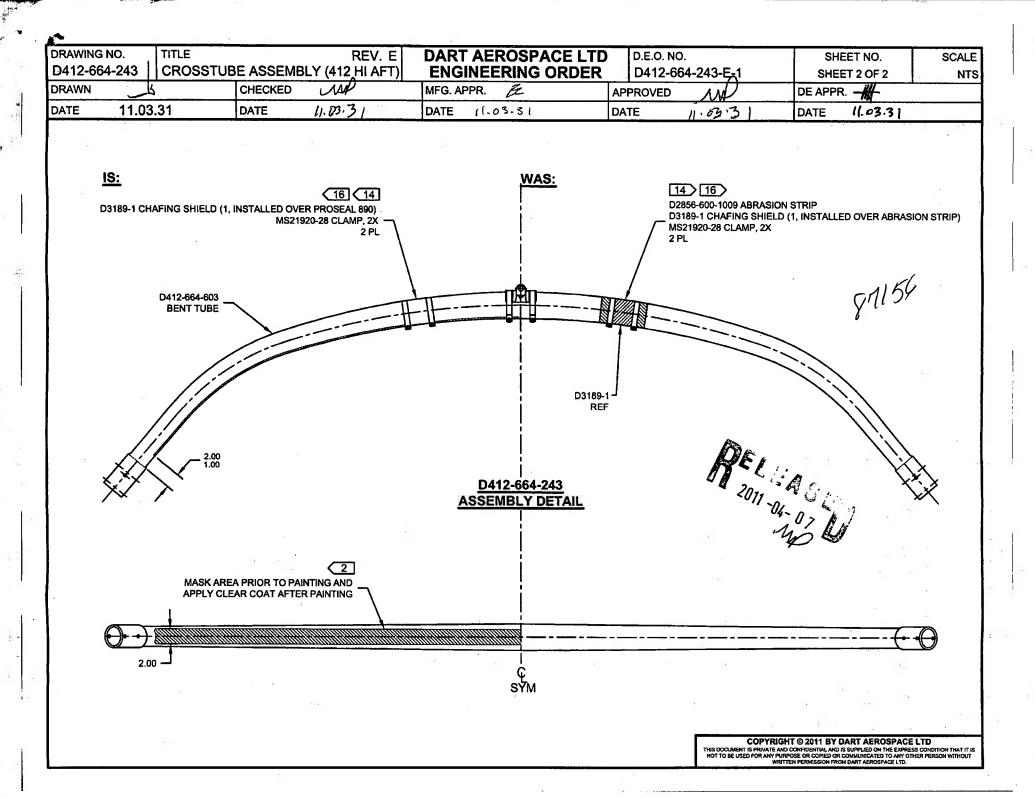
Wave/Twist in Tube

Torque Waves in Extrusion

Drawing

Finish

H:/FORMS/Quality Assurance\approved QA/NCRWO Rev G



| | | | | DQA: | Date: | . ` |
|---------------|---|----------------|----------------------|------|-------|-----|
| NCR: Yes / No | W | ORK ORDER NON- | CONFORMANCE / UPDATE | | | |

| NCR: | NCR: Yes / No WORK ORDER NON-CONFORMANCE / UPDATE | | | | | | | | | | | | | |
|---------------|---|-----------------------|-----------|--|--|-----------------------------|----------------------------|----------------|--|---------------------------|--------------|--------------|--------------------|--|
| | | | | | | | | | 440 | | QA Closed: | Date | • | |
| Work Ord | er: | | | | | DISPOSITION | AGAINST DEPARTMENT/PROCESS | | | | | | | |
| Part No | | | | Rework Scrap Use-as-is Work Order Update | Skid-tube Crosstube Machining Small Fab Thermoforming Finishing Large Fab Composite | | | - | Water Jet d. Eng. Coor. e/Packaging Supplier | Engineering Quality Other | | | | |
| Root | | | | | Descr | iption of work order update | ı | nitial | Ac | tion | Sign & | | | |
| Cause | | Date | Step | Qty | | or Non-conformance | Ch | ief Eng | Desc | ription | Date | Verification | QC Inspector | |
| Doc/Data | | | | | | N. A. | | | | | | | | |
| Equip/Tooling | | ٠, | | | . 9 | | | | | | | | | |
| Operator | | | | | | | | | | | | | ļ | |
| Material | | | | | | | | | | | | | | |
| Setup | L | _ | | | | 1 | | | | | | | ļ | |
| Other | | | | | | | | | | | | | | |
| Process | | | | | | * . | | | | | | | | |
| Supplier | | | | | | · | | | | | | | | |
| Training | | | | - | | 1 | | | | | | | ļ | |
| Unapproved | | <u> </u> | | | 1.0 | <i>d</i> . | <u></u> | | | | ļ | | · · | |
| | | | | | | | AUL | T CATE | GORY | | | | | |
| Landi | ng (| 3 | | | _ | General | | 1 | | , | 7 | _ | - | |
| | _ | Bending | | | . - | Bend | | Grain | | | Ovalized | _ | Pressure/Forced | |
| | _ | Centre No | ot Concer | ntric to | o/s | BOM/Route ·· | \vdash | Hardwa | | 5 | Over/Under | <u></u> | Temperature/Cure | |
| | <u> </u> | Cracks Broken/Damaged | | | | - | l ' | ion incomplete | | Part Incorre | <u> </u> | Weld | | |
| | _ | Crushed/ | Crimped. | | ` | Burrs | $\overline{}$ | 1 | ions Incomplete, | /Unclear | Part Lost/Mi | issing | Wrong Stock Pulled | |
| | - | Cuffs | | | | Contamination | | Mainte | | | Part Moved | | | |
| | _ | Heat Trea | | | <u> </u> | Countersink | _ | Mislabe | | | Positioned V | | | |
| | _ | Inspection | | | | Cut Too Short | - | Misread | t | | Power Loss/ | 'Surge | Other | |
| | _ | Ripples in | | • | | Drill Holes | - | Offset | | | | | | |
| l | Torque Waves in Extrusion Drawing | | | | | Out of (| Calibration | | | | • | | | |

Out of Sequence

Outside Dimensions

Turning Sequence

Wave/Twist in Tube

Finish